

An abstract of the paper

Antibiotic treatment of poultry in
relation to Salmonella typhi-murium

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A REPORT ON THE ANTIBIOTIC TREATMENT OF POULTRY
IN RELATION TO SALMONELLA TYPHI-MURIUM.

Abstract of the Report: Preliminary experiments showed that 10 p.p.m. chlortetracycline (aureomycin) mixed with minced chicken, and also with sausage meat, inhibited the growth of strains of Salmonella typhi-murium and staphylococci sensitive to the antibiotic. Resistant strains, however, grew readily at 15° and 22° C., presumably unimpeded by the growth of spoilage organisms inhibited by the antibiotic.

Production of natural carrier state

Later experiments were designed to follow commercial practice. Eviscerated poultry carcasses were dipped into ice slush containing 10 p.p.m. aureomycin, placed in polythene bags, frozen and stored at -30° C. until required. The chickens used in the experiments had been divided into experimental and control groups involving antibiotic feeding and infection by mouth with known phage types of Salm. typhi-murium, including strains that were sensitive and resistant to chlortetracycline. Thus, a natural carrier state was produced in the birds. When they were killed in the usual commercial fashion, the method of evisceration by hand ensured that gut material was spread over the skin of the carcasses. Viscera and cavity swabs were examined from each bird to confirm the presence of Salm. typhi-murium.

Overgrowth of spoilage organisms by resistant salmonellae in presence of antibiotic

Salmonella and total colony counts were made after 1, 2, 3 and sometimes 5 days on skin samples from the thawed chickens stored at 15° C., and in one experiment at 22° C.; the chickens were showing obvious signs of

spoilage after 3 days' storage at 15° C., and after 2 days' storage at 22° C. It was assumed that the great majority of housewives do not yet possess a refrigerator and that they store chickens for one or even two days at atmospheric temperature before cooking. The results showed that sensitive strains of Salm. typhi-murium, with a sensitivity well below 10 p.p.m. of the antibiotic, were inhibited together with the sensitive spoilage organisms. The highly resistant strain used which was able to grow in 100-200 p.p.m. aureomycin grew on the skin of dipped and undipped birds in a similar way at 15° C., but at 22° C. the growth on the skin of the dipped birds was faster than that of the undipped control birds. The salmonella counts for the dipped birds were approximately 1,500 - 15,000 per gm. of skin after 1 day and 150,000 - 1,000,000 after 2 days, compared with approximately 500 per gm. only on the skin of the control undipped birds for the same period of time. The results showed, therefore, that, where the salmonellae were growing in competition with spoilage organisms, the numbers of salmonellae on the skin of dipped birds increased more on the first and second day of storage at 22° C. than on the skin of undipped birds held at the same temperature.

The importance of this finding should perhaps be related to the incidence of antibiotic-resistant strains of Salm. typhi-murium in poultry, and also to the effect of feeding antibiotic on the resistance of Salm. typhi-murium.

Frequency of antibiotic-resistant strains

662 strains of Salm. typhi-murium from human, animal and food sources were tested for their sensitivity to aureomycin; 110 strains isolated in 1947, 1952 and 1957 were sensitive to chlortetracycline. 552 cultures were examined from strains isolated in 1958 and 1959; 163 strains were from human sources and 135 were of animal origin and of these 2 (1.2 per cent) and 8 (5.9 per cent) respectively were resistant to 1000 p.p.m. chlortetracycline;

all of 254 strains from foods were sensitive. Huey and Edwards (1958) found that 9 per cent of the strains tested by them were resistant to aureomycin.

Persistence of carriers in chickens given antibiotic

In the description of the work carried out at the Houghton Poultry Research Station, it is observed that the presence of antibiotic in the diet reduced the mortality among infected chicks, so that more chicks survived to become carriers, especially in those groups infected with resistant strains. Twenty-one days after feeding with Salm. typhi-murium the number of chicks excreting the organism fell rapidly until ^{by} the tenth week after infection the carrier rate ranged from 6.7 per cent in non-antibiotic fed chicks to 37.7 per cent in antibiotic fed chicks; this increase was almost wholly due to the persistence of resistant strains.

Increase in resistance of strains in chickens given antibiotic

Furthermore, increased resistance was demonstrated in strains after passage through chicks receiving 25 - 100 gm. per ton of chlorotetracycline in the diet. No increase in persistence occurred when the same strain was given to chicks fed on the same diet without antibiotic. As yet there is insufficient published information on the carrier rate of salmonella in poultry concerned in the broiler industry, but it is interesting to note that, apart from the phage types of Salm. typhi-murium used to infect the chicks in these experiments, other phage types were isolated from the birds; no explanation could be found for this fact.

Summary: It may be concluded that an unknown proportion of poultry will be carrying salmonellae at the time of slaughter. The experiments indicate the ease with which these organisms can spread on the skin of the birds and in the environment. It is expected that a small proportion of the

salmonellae will be resistant to aureomycin and in these instances the hazard with regard to salmonellosis to consumers who keep poultry for 1-2 days without refrigeration would be greater for acronized (antibiotic treated) than for non-acronized birds.

Reference

Huey, C.R. & Edwards, P.R. Proc. Soc. Exper. Biol. & Med. (1958), 97, 550.